

CENTRALIZED EDUCATIONAL INSTITUTION MANAGEMENT SYSTEM

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This report presented in partial fulfillment of the requirements for the degree of Master
in Computer Applications

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DECEMBER 12, 2016

DECLARATION

We hereby declare that, this project has been done by us under the supervision of **Dr. Amitabha Chakrabarty**, BRAC University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree.

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ACKNOWLEDGEMENT

The authors are thankful to the Department of CSE, BRAC University for providing the computing facilities to carry out this work. Any accomplishment requires the effort of many people and this work is no different. Our sincere gratitude goes to **Dr. Amitabha Chakrabarty** Assistant Professor, Department of CSE in **BRAC University**, with whom we have had the opportunity to work and whose thoughts and insights have helped us in advancing our knowledge and understanding of the project. We also want to thank him for his guidance and valuable suggestions, which made this paper a successful one. We are very thankful to several schools and colleges, their teachers and staff members, especially in **West End High School, Rahmatullah Model High School** and **Bir Shreshtha Noor Mohammad Public College** for giving us time and information and allowing us to use their given data in our project and being so welcoming. We are also thankful to our classmates and faculties in CSE department and every other person who helped us in every possible way throughout this project.

Finally, we must acknowledge with due respect the constant support and patience of our parents.

ABSTRACT

Like many other sectors in Bangladesh, education has not been a major beneficiary of the advancement of modern information and communication technology. Till today, the whole education system in this country runs on a severely outdated, largely inconvenient and complex set of procedures and activities. The urge to develop this sector with the use of modern information systems has led this project to explore the possibilities of a functional, sizable yet technologically as well as economically practical centralized education system that will adhere to existing working methods and models but make the whole scenario more connected and unified.

This effort tried to utilize the basic Internet based information management and database systems that are widely being used today. While this proposed model did not try to reinvent the whole system for the sake of advancement, it tried to implement mostly the common and existing practices around in a never before tried ground of this country. The project conducts a research, analysis, design and evaluation for developing a web application for centralizing education system for Bangladesh. This will benefit all the stakeholders ranging from the students, teachers, administrative staffs to the different Govt. and non-Govt. organizations to access data from a centralized, real time system leading to faster and better understanding and decision making as well as significant reduction of processes, time consuming activities and costs.

In the end, this proposed system may be far from being a complete solution to centralize the education sector of Bangladesh but it will indeed show the vast possibilities and improvements that such a system may provide.

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Chapter 1
INTRODUCTION

Over the last couple of decades, computers, internet, cell phones and many other ICT innovations of late 20th century has changed almost every aspect of our lives. Bangladesh, being a low-income country and having a high rate of illiteracy with a huge population has surprisingly shown a much better result than anticipated in the penetration of ICT in peoples' lifestyle. However not all the sectors of this country were fortunate enough to receive the blessings of ICT advancements in comparison to the developed or even some of the developing countries. Education sector is a prime example of such cases.

While ICT has already revolutionized the education sector in many countries around the world, our effort in implementing ICT to this sector has been very limited. Countries around the have been using systems to manage, monitor and develop their education systems for quite a while. But till today, our education system is running mostly based on age old paper registers. Which makes the whole process of information collection, transfer and processing much more complex, time consuming and inconvenient. Real time availability of information on a larger scale becomes an almost impossible job in our current system.

Today over 150 thousand schools and colleges of different types providing education to over 32 Million students ^[1]. This number shows the scale of a sector that is left open to the utilization of information technology for its' management. There is a massive ground for expansion to other underdeveloped countries and this has the drive and determination to reach out and help education from a technological perspective. The prospective for investment is high, and requires little investment.

Centralized Educational Institution Management System (CEIMS) will create a centralized management system, where the government and the general population will be able to monitor the education system and performance of individual institutes. This will create the need for the individual institutions to keep improving and in turn, the education system. In addition, the technology-based learning model that this system will provide has been successful, productive and revolutionary for many of the countries all over the world. This promises to educate with a greater standard, and create a sustainable change in education and in the country.

1.1 Motivation

The primary aim of this project was to help maintaining historical data and progress of an individual student. This idea later evolved as a much larger information and management system spanning across multiple work areas.

According to the Master Plan for Information and Communication Technology in Education (2012-2021), Ministry of Education planned to modernize the education sector. The plan includes development of infrastructure, digitalization of class rooms to development of management system for education administration ^[2].

This ground served a perfect opportunity and provided encouragement for working on such a project.

1.2 Project Contribution

1.2.1 Problem Statement

The focus of this project can be broadly highlighted as following points -

- To develop a centralized, connected, real time information system for managing educational institutions in Bangladesh
- To make a system that does not change current tasks and activities rather makes them easier
- To enhance the management of the educational institutions in local, regional and national levels
- To increase transparency between various stakeholders
- To provide management consistency across institutions, regions, mediums and Govt. wings for improved information sharing and decision making
- To make information readily available and accessible for different stakeholders

1.2.2 Solutions

The proposed system consists of range of interconnected but fully independent modules that will aggregate to build a fully featured and highly prospective system once deployed. These modules will be connected to a centralized database system that will provide real time feedback. Also, a notification system based on mobile phones will also be connected to the central system to provide instant information to the stakeholders.

The heart of this system is a robust database which connects each and every institution under a single data collection structure.

1.2.3 Methodology

While designing the system, it has been kept in consideration that it must utilize the existing technologies. It must not try to implement any technologies that are highly complex, expensive to implement and maintain. It has also been considered that the existing routines and activities should not be changed much. Rather, they will be brought to a digital system which will make the tasks and activities easy, efficient and effective.

Initially this project was planned to carried out in a Waterfall like model. As there are huge and complex set of activities in the existing practice. However, several steps had to be extended and carried out for a longer time due to the scale of the work and the sector being worked on.

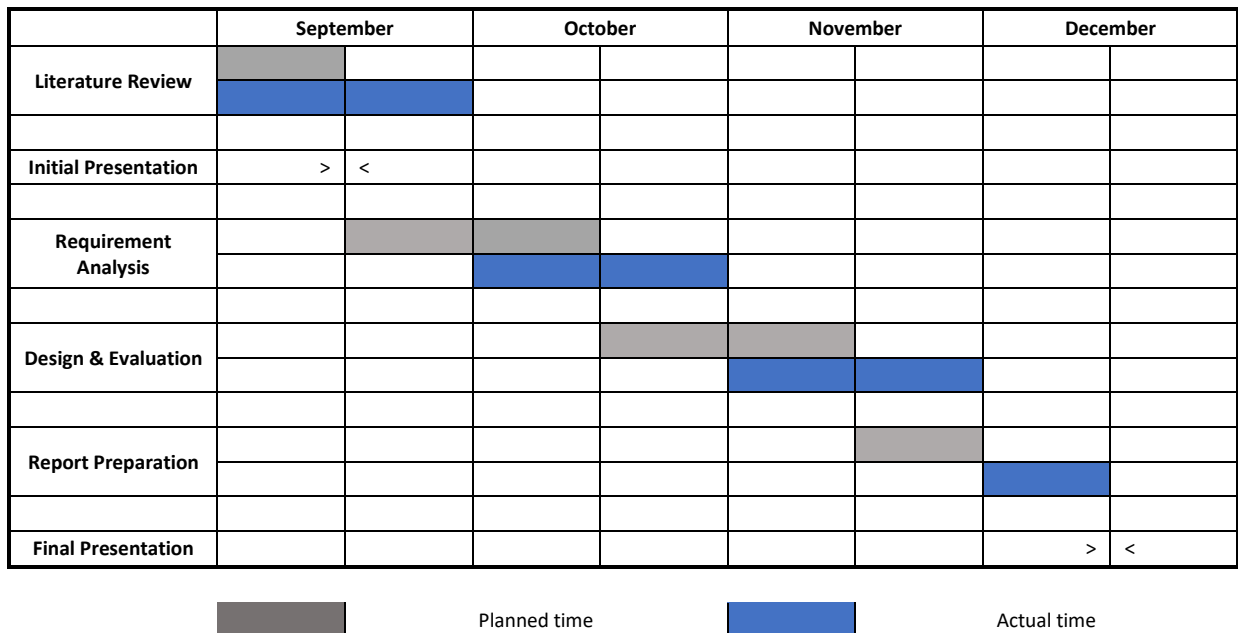


Figure 1.1: Gantt Chart of the Report

1.3 Summary of Contributions

The contributions of this project are listed below:

- We studied the existing model with an analysis of existing workflows
- Analysis has been done on the similar systems that are being used on the other countries
- The structure of the database for such system has been proposed and analyzed
- Several key use cases have been shown and discussed

1.4 Outline of the Report

This report has been organized as below -

Chapter 2 discusses the background, review of existing model and similar works that's been implemented around the world.

Chapter 3 discusses the design and technical details of the proposed system.

Chapter 4 summarizes the discussions and concludes the report.

Chapter 2
LITERATURE REVIEW

2.1 Analysis of Existing Model

Today nearly all the work from admission of the students to reporting, bookkeeping all are done manually by paper based system, which is extremely slow and consuming much efforts and time. Moreover, the redundancy of data, repetition of processes make things highly inefficient.

For example, when a student applies to a school, he has to go through a detailed form. When he gets the chance through the admission tests and goes to take admission, he has to go through another admission form which has mostly common information as the previous one. Processes like this make the existing system inconvenient and inefficient.

Apart from the above example, our existing system has almost all the records and documentations stored in papers. Which makes them inaccessible at convenient times as well as makes it almost impossible to analyze them for decision making.

This system makes the historical data of a student, teacher or an institution technically irrelevant as they don't have any use. The difference of the data collection and storage processes among different institutions also creates difficulties to combine them.

One of the very few tasks that's been computerized is the publication of exam results online. But it is often faced with challenges such as slow down of server during the day any mass examination result is published. Besides, this has very little use on the other times than the results are published.

Directorate of Secondary and Higher Education is implementing an Education Management Information System (EMIS) for the secondary and higher secondary institutions only ^[3]. It however is extremely primitive, lacks features compared to similar systems and does not replace the existing works rather sits as an additional system.



Figure 2.1: Home of EMIS of DSHE

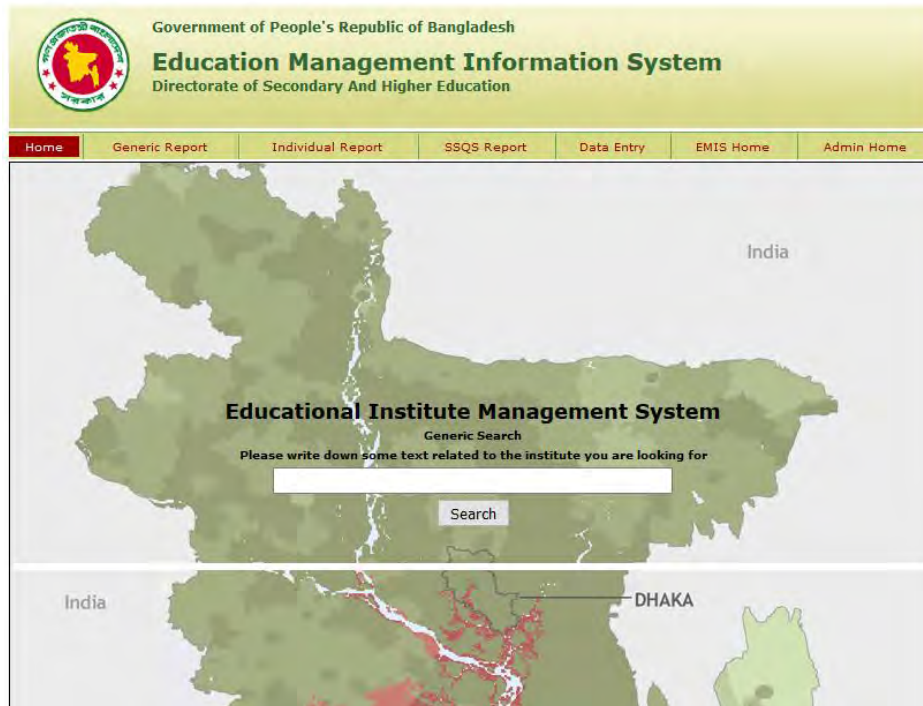


Figure 2.2: Reports Home of EMIS by DSHE

Another separate information system is being implemented for the colleges known as **College Management Information System**. This too is early in practice, lacks feature and cohesion with the other systems and focused mostly on data collection and reporting.



Figure 2.3: Home of CMIS

It can be seen that efforts are being made for implementing ICT in our education sector already. But these systems still inconsistently placed, workflows are not merged with the regular workflows rather they function as additional workflow over the regular ones. The existing management system of our education system lags behind the developed ones due to this poor infrastructure.

2.2 Similar Works Around the World

OpenEMIS is a generic and Open Source Education Management Information System (EMIS) designed to collect and report data on education systems ^[4]. The system was initially conceived by UNESCO to be easily and quickly customized to meet the specific needs of the educational systems of Member States. ^[5]



It has multiple interconnected modules which provides management, analysis and representation of information. It also is highly customizable and features an offline system. It is a suite of interrelated software solutions that supports data collection (Survey; Classroom; Staffroom), management (Core; School; Integrator) and analysis (Visualizer; Monitoring; Dashboard; Analyzer; DataManager; Profiles).

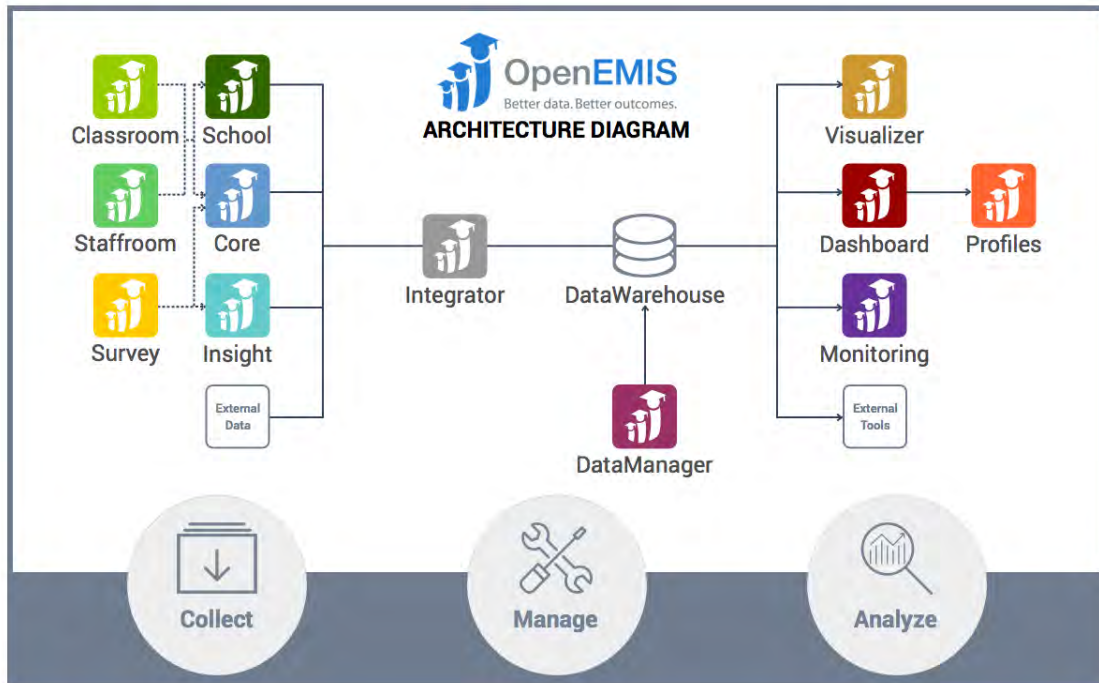


Figure 2.4: Architecture Diagram of OpenEMIS [Source: Wikipedia]

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(Visualizer; Monitoring; Dashboard; Analyzer; DataManager; Profiles). Each application is designed to provide unique standalone features to support different information management requirements at different levels. These features could be customized and integrated with existing systems. As open-source solutions, OpenEMIS benefits from coding contributions from the larger community. The OpenEMIS Initiative utilizes End-user license agreements and Contributor license agreements to ensure maintenance of standards, quality assurance and that the product remains free from commercialization.

It is currently being implemented in Malaysia, Grenada, Jordan, Maldives and some other countries [6].

Sampoorna is a project of school management system implemented by the Education Department of Government of Kerala, India in order to automate the system and process of over 15,000 schools in the state ^[7]. Sampoorna is implemented by IT@School Project using a free and open source school ERP program Fedena.



The main objective of the Sampoorna school management software is to facilitate the Principals, Head Masters and teachers to easily implement, track and monitor all activities of students of their school and that of the school itself. Various cumbersome processes such as preparation of Transfer Certificate, copying of Admission Register, generating various reports related to students, parents, teachers and non-teaching staff, generating lists for various scholarships, preparation of SSLC examination database, progress report preparation, promotion list preparation, entry forms for sports and games etc. are made easier using this system ^[8].

2.3 Different Systems Currently Used in Bangladesh

In Bangladesh, several private institutions, mostly are English medium schools, are using their own information systems developed by different local or foreign developers. These systems are used within the particular institution without any feature to connect with Govt. run information system.

These systems are feature rich and customizable but lacks a common framework. They are customized according to the need and structure of their client institutions. But none of them are not robust enough to implement in a countrywide network.

Chapter 3
PROPOSED SYSTEM

3.1 General Descriptions and Features

In order to find a solution to propose a system which will centralize and connect all the stakeholders across different levels, we have tried to design a highly connected and integrated system.

CEIMS is defined as an application based on Internet that is run by information fed and taken by all the levels of management. It will reflect the existing processes but make them computer based rather than paper. This system can be used as an information management system for the schools and colleges.

The core features of this system will be –

- Student Information Management
- Teachers Information Management
- Human Resource Management (For non-academic staves)
- Finance and Accounting
- Academic Process Management
- Time Schedule Management
- Scholarships, Stipends, Aid Management
- Payroll Management
- Online/Mobile Payment Collection
- Reports and Monitoring
- Examination and Performance Management
- Budgeting and Resource Allocation
- Library Management
- Virtual Campus/Resource Library
- Broadcast, E-mail, SMS integration

All these features will revolve around a central database. All data will be stored securely on SQL servers managed by the regional admin or central admin. This system will provide a simple interface for the users so that the users don't feel the complexity of such system.

Though there are many features and modules planned in this system. But an institution will be able to choose and implement the modules it needs. Some of the core modules, such as the student information, teacher information, examination etc. will be mandatory in order to maintain functionality of this system. Other modules such as library management, virtual campus etc. will be optional to implement.

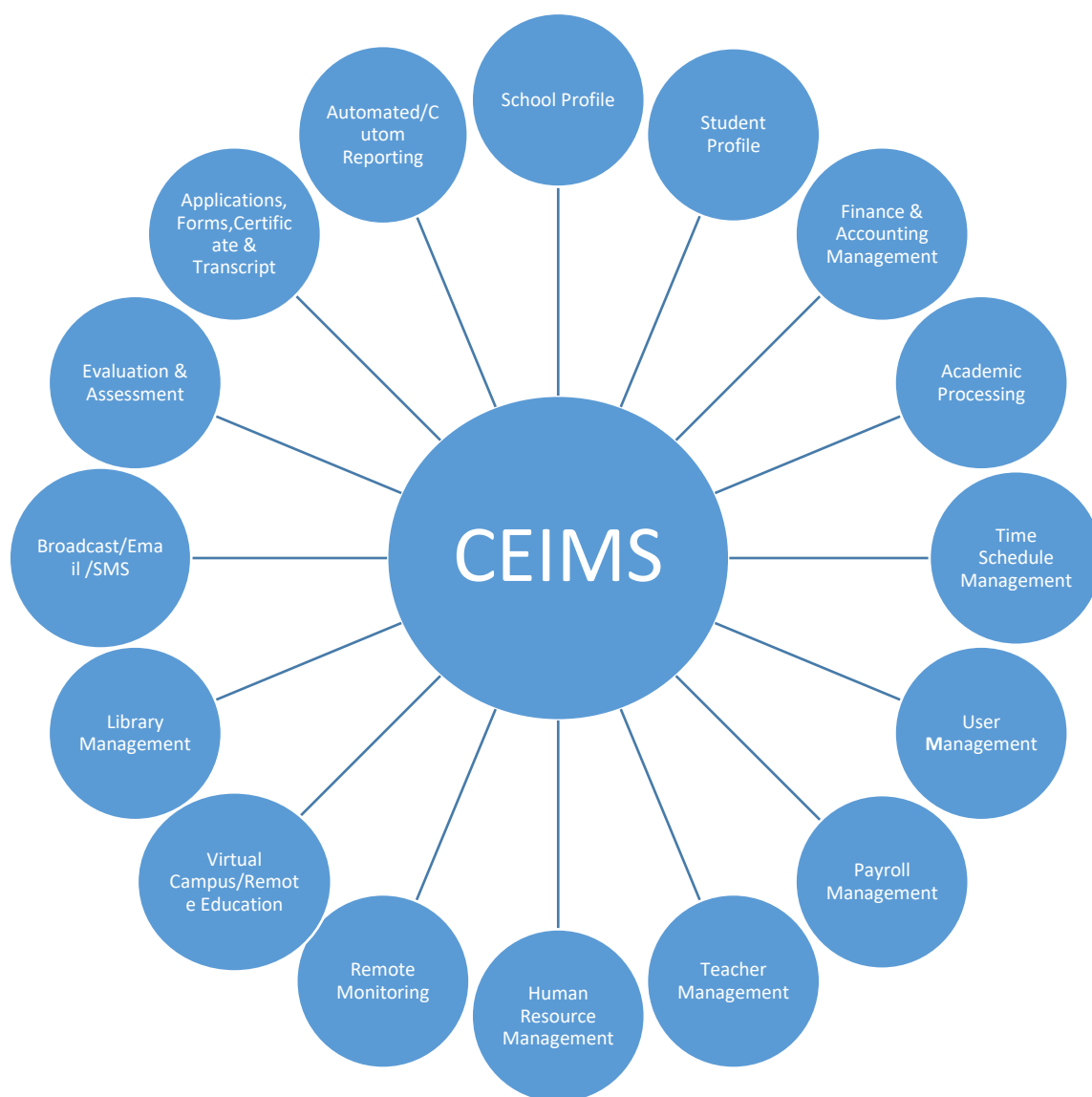


Figure 3.1: Modules of Centralized Educational Institution Management System

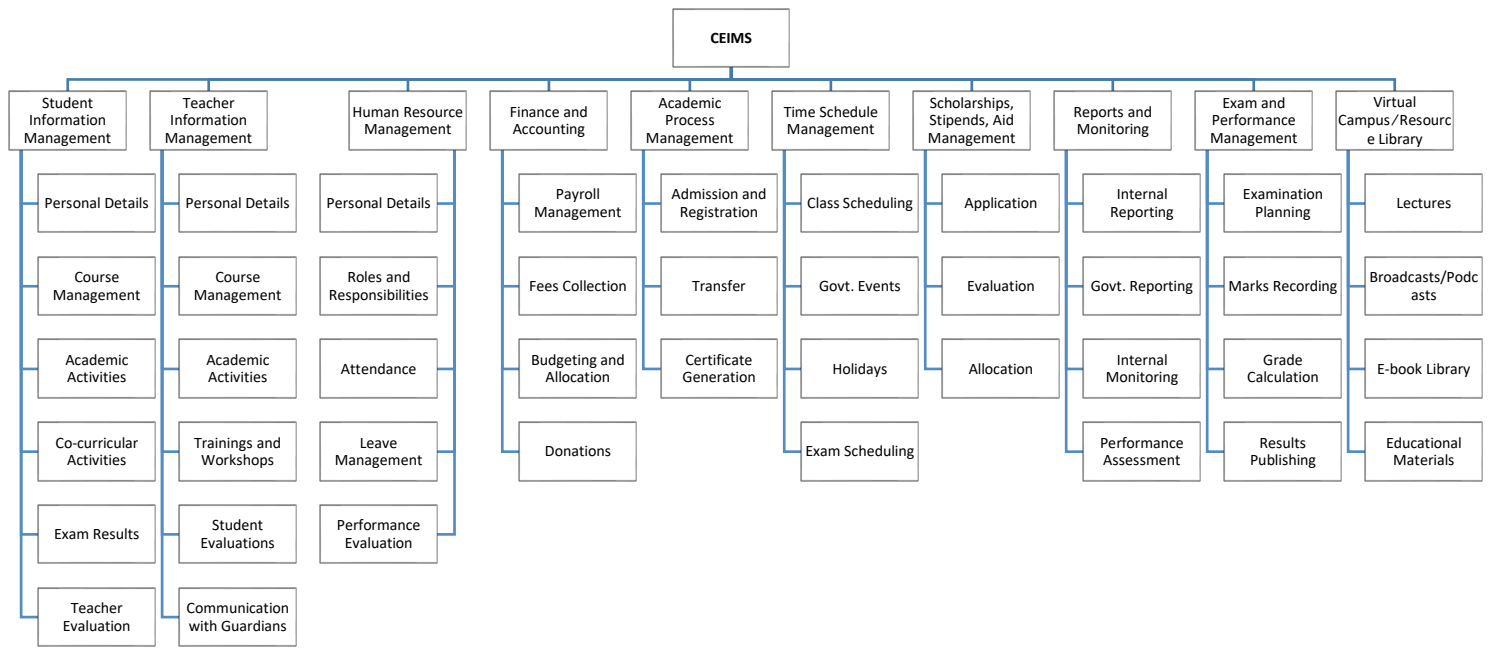


Figure 3.2: Feature Distributions of CEIMS

3.2 User Access Design

The design of user types and access of such a largescale system has to be carried out carefully. Based on the current practices, the possible user types are –

- Students
- Teachers
- Administrative/Non-Academic Staves
- Guardians
- General Public
- Govt. Officials related to Administrative Tasks
- Higher Officials and Policymakers

A careful design and access control is needed to ensure data security and confidentiality wherever needed.

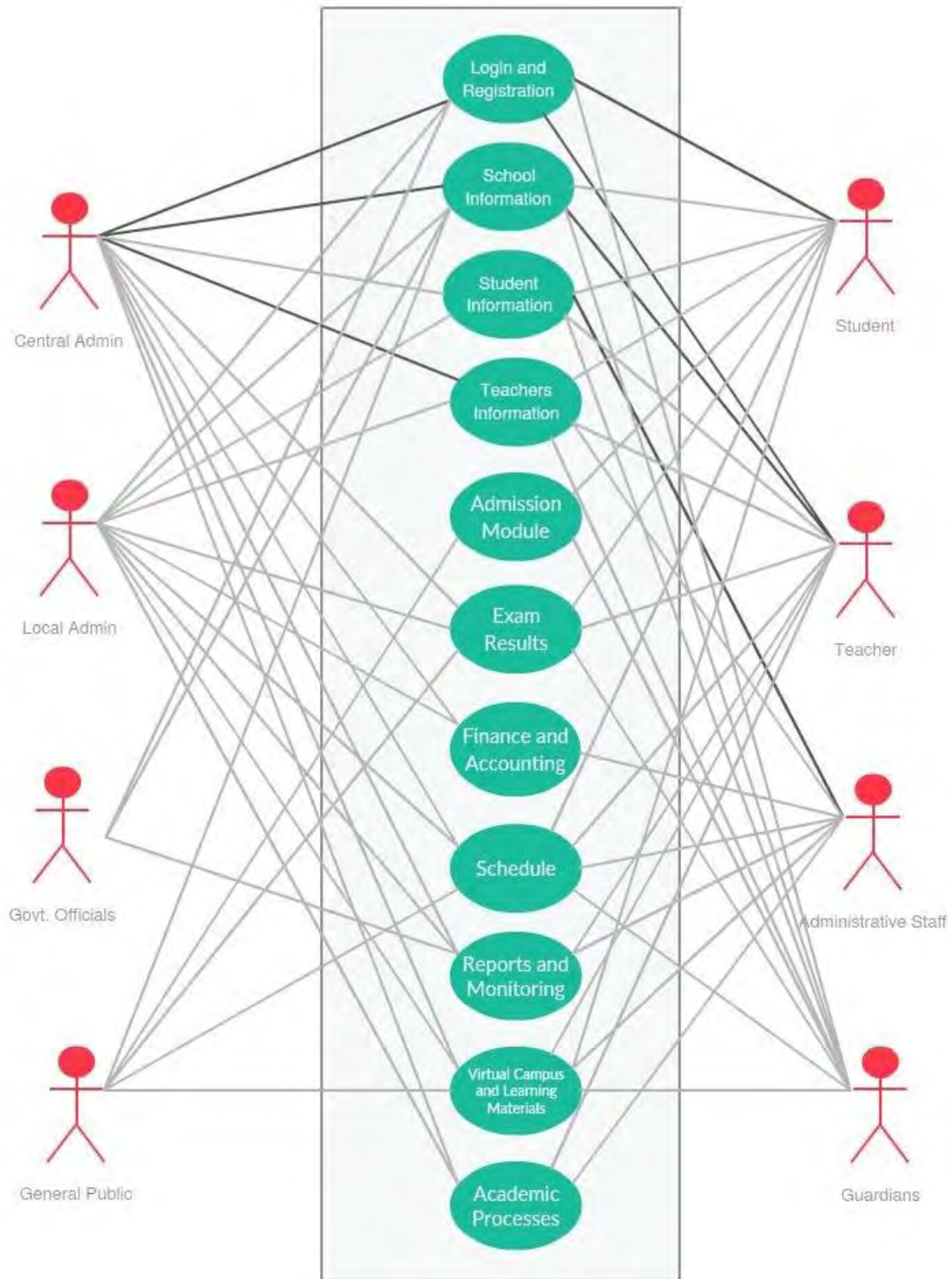


Figure 3.3: Use Case Diagram

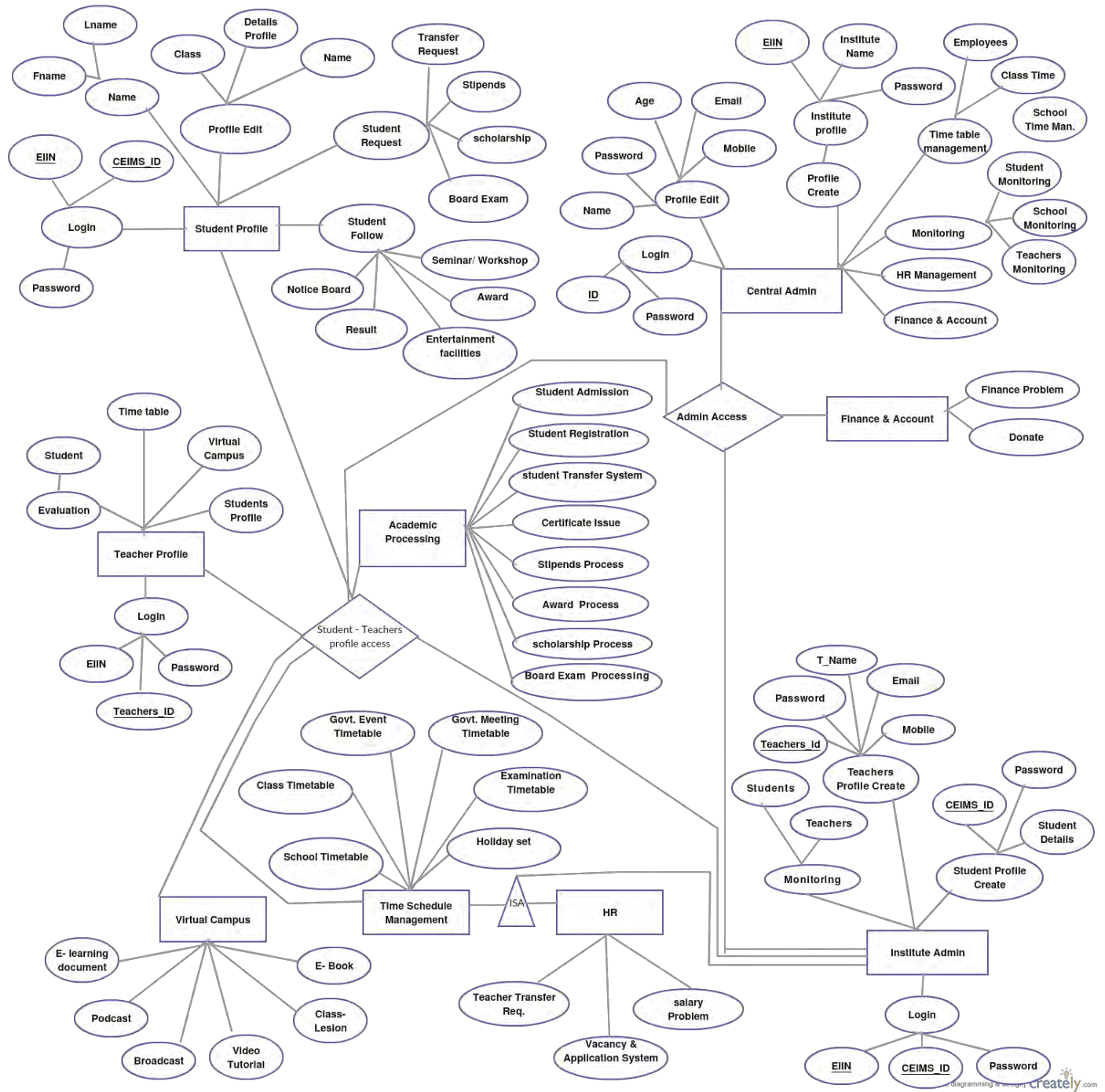


Figure 3.4: Entity-Relationship Diagram

3.3 Server Distribution Design

Design of server distribution of the proposed system was a major and vital part of this project. Connecting for almost 32 Million Students, over one hundred fifty thousand institutions and possibly over 50 Million users to a single system will not be an easy task to manage.

However, we have tried to carry it out with the best probable and scalable outcome. The population density map of Bangladesh shows a higher density of population in the cities and towns and much lower density in the rural areas. We assume that the distribution of students will follow the same map more or less.

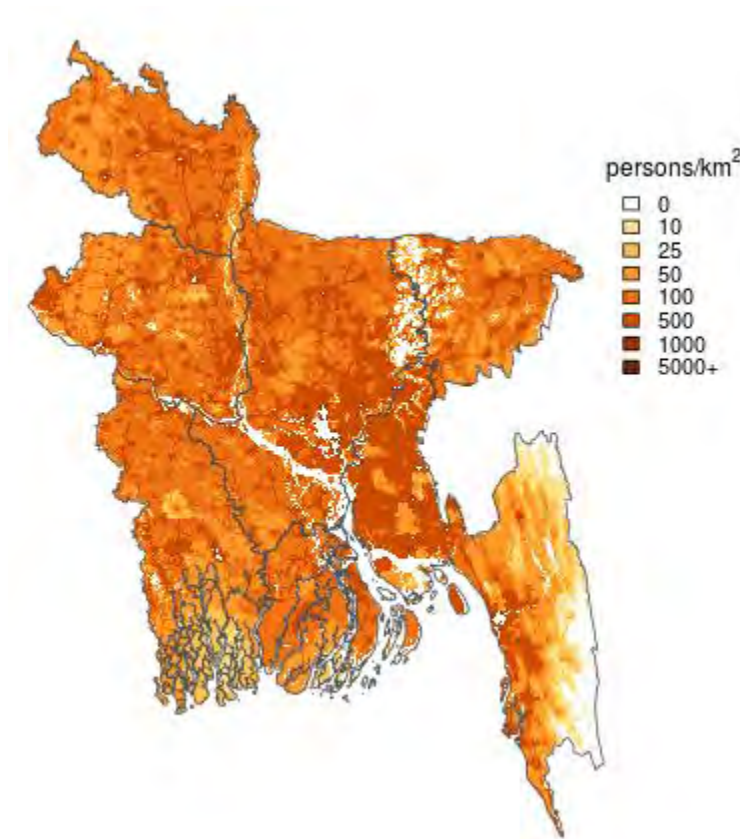


Figure 3.5: Population Distribution of Bangladesh [Source: FAO]

Keeping both this large scale and a realistic budget and resource availability in mind, the proposed system's servers were distributed in three layers.

- Layer 1: The Central Database
- Layer 2: Education Board Databases
- Layer 3: District Level Databases

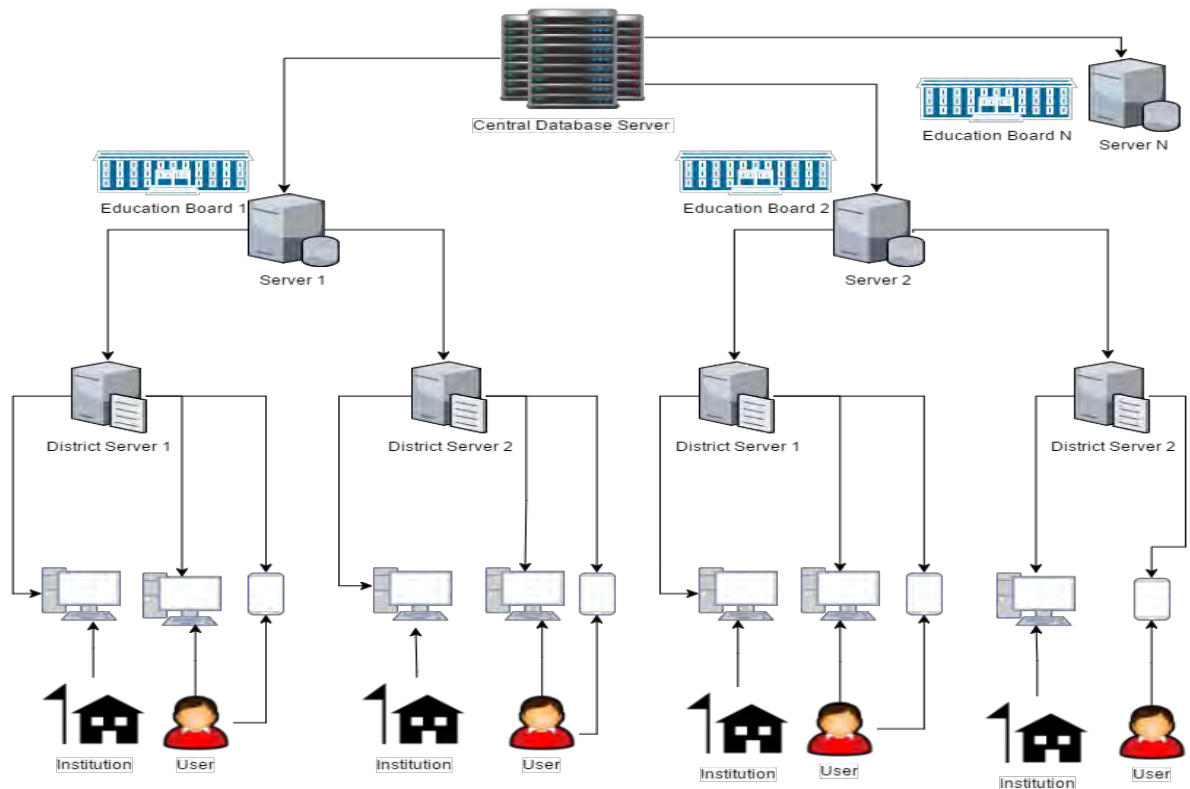


Figure 3.6: Server Distribution

The central database will act as the master database. It will facilitate data transfer among inter-board servers. The central admin will be responsible for this server and authorize inter-board data transfer.

Second layer servers will be divided based on the traditional education boards. These will act as the divisional databases with control over the layer 3 databases and inter district data transfers.

The third and last layer will be based on the districts. All the schools and colleges within district will be connected to this layer directly. Number of servers in a district may vary depending on the load. For example, Dhaka, Chittagong and some other districts have much higher number of users and institutions compared to the rest. So, the number of servers for these districts need to be much higher than the rest.

3.4 System Requirements

The system must be able to run on an entry level computer, mobile, tablet equipped with an internet connection and browser.

3.5 Some Key Modules and Data Flow Diagrams

System with such complex network of activities have extremely complex and large data flow diagrams. However, we have tried to design some of the key data flow diagrams of the system to provide some exemplary designs.

3.5.1 Central Admin

The Super user of the system. The Administrator handles the setting up of other lower level administrators.

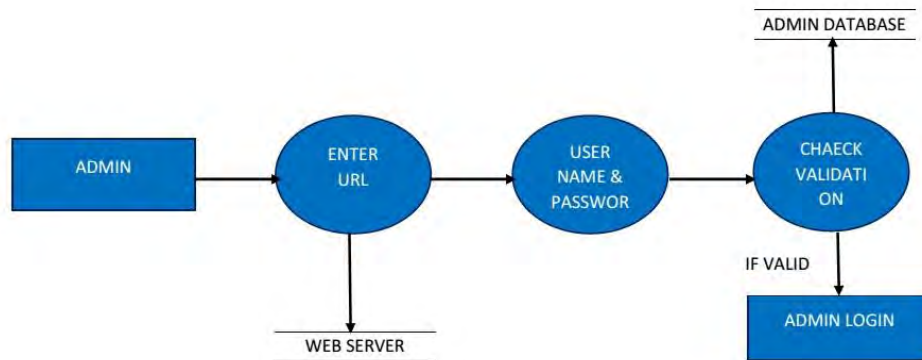


Figure 3.7: Data Flow Diagram for Central Admin Login

After entering to the home page of the CEIMS, Admin can choose the admin LOGIN option where they are asked to enter username & password, and if he/she is a valid user then an admin login page will be displayed.

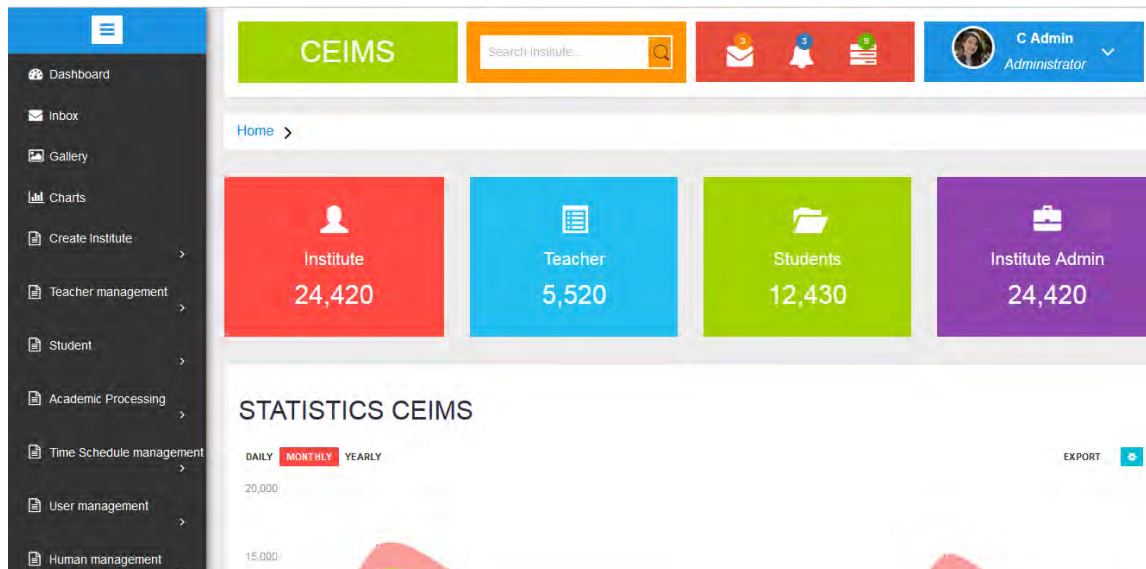


Figure 3.8: Central Administrator Mock Dashboard

3.5.2 Profile Creation

Central admin can create institute profile which can be further expanded by the local admin/teacher.

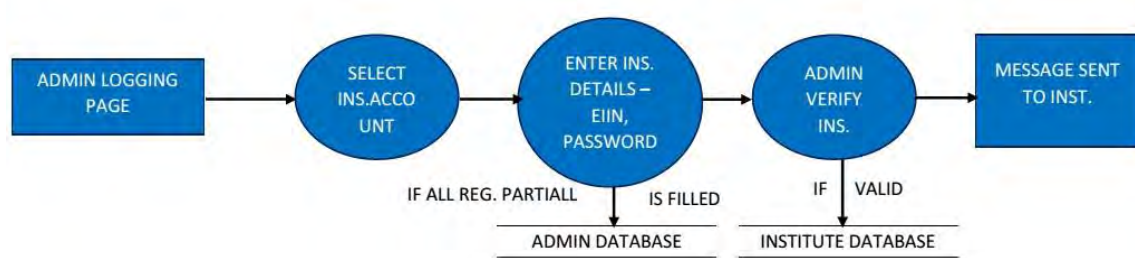


Figure 3.9: Data Flow Diagram for Institute Profile Creation

After the admin login, there will be an option of CREATE/SELECT INSTITUTE ACCOUNT where Admin have to provide the EIIN (Educational Institution Identification Number) and an OTP (One Time Password) along with some basic information to create a profile/account for an institution. Once created, the details can be further updated by the institution admin/teachers.

The mockup shows a 'Create Institute Account' screen with a blue background. It contains six input fields, each with a red label box on the left: 'Institute EIIN No:' (with placeholder 'EIIN No'), 'Institute Name:' (with placeholder 'Institute Name'), 'Institute Location:' (with placeholder 'Location'), 'Email:', 'Password:', and 'Confirm Password:'. A dark blue 'Sign Up' button is located at the bottom right.

Figure 3.10: Create Institute Profile/Account Screen Mockup

3.5.3 Teachers and Employees Login

CEIMS will provide a user-friendly platform for teachers and employees. It aims to simplify most of the difficult work and thus reduces consumption of time. The system will have separate accesses, modules and functionalities for teachers and non-academic employees.

Some major features that will be available for teachers are -

- Online monitoring of academic related functions
- Instant notification/messages by e-mail/SMS
- Online student assessment
- Performance analysis
- Online homework assigning
- Study group creation
- Online assignments publishing
- Online discussions
- Online tuition
- Online lectures/materials for absentees
- Publishing of educational activities and events
- Publishing exam, quiz results
- Homework, lab and projects, assigning
- Send private message to the students or parents

3.5.4 Teacher Profile

After the institute admin login, there will be an option of CREATE TEACHERS ACCOUNT. Local/Institute admin will be responsible for creating and managing teacher/other staff accounts.

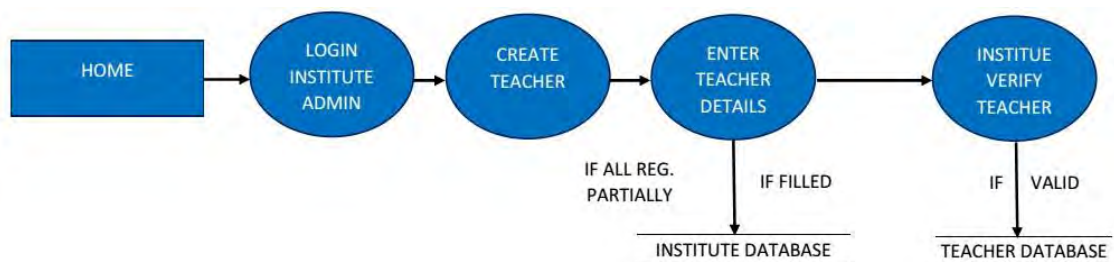


Figure 3.11: Data Flow Diagram for Teachers Account Creation

3.5.5 Schedule Management

Schedule management is an essential activity of all academic institutes. Assigning and changing a class routine, scheduling events and activities, managing Govt. holidays etc. can be a difficult and cumbersome task. CEIMS aims to make this a much simpler and convenient task.

Major features of the Schedule management module are-

- Management of Timetable/Scheduling for better class management
- Quick access to add/delete/allocate class to old/new faculty
- Time management of the classes/seminars/lab/others
- Instant Notification of the changes in timetable
- Govt. Holidays auto notifications
- Alerts on upcoming events
- Easier assigning of replacement teachers for the teachers on leave

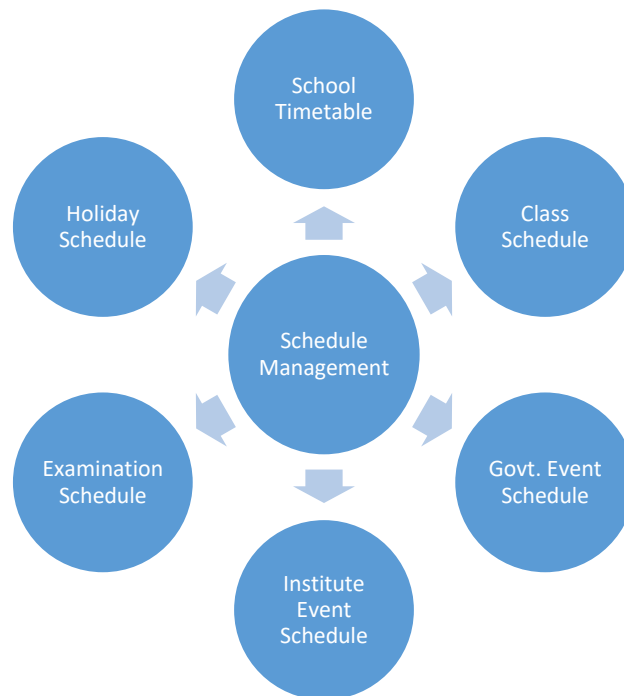


Figure 3.12: Schedule Management Module

3.5.6 Reporting and Monitoring

The academic monitoring module will have multiple levels for multiple user types. For example, the higher officials within the education board may want to have periodic reports on the progress of different institutions, regions, on different factors. The system will provide options to generate report automatically based on selected criteria, will present them both numerically as well as visually and send reports to the designated e-mail addresses.

On the other hand, teachers within an institution may want to have reports on their overall performance, student performance, activities in order to take actions for future. The system will enable them with enough tools and reports to monitor activities on any desired level.

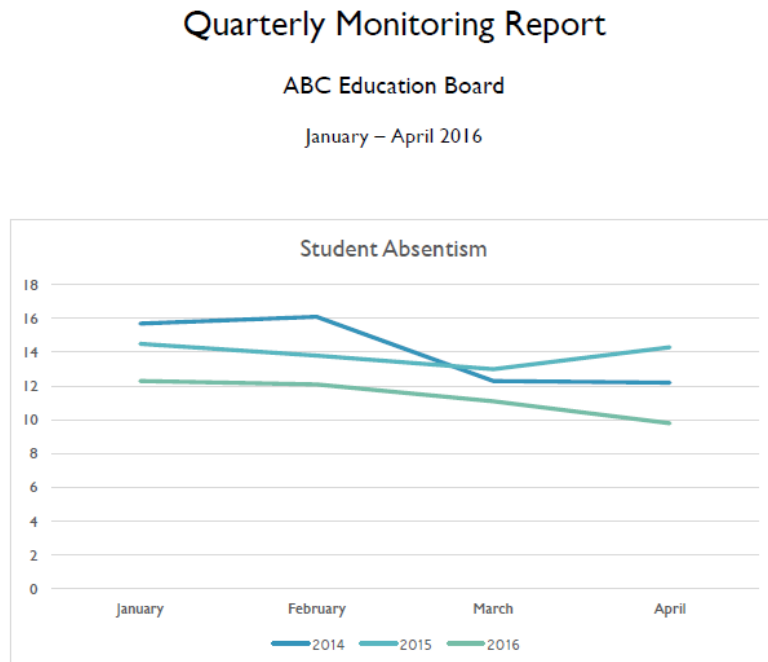


Figure 3.13: Mockup of a Monitoring Report

3.5.7 Student Account Creation

Student account can be created by a local admin. A student then will be able to update his/her information from dashboard. Each student will have a unique ID which will function as his/her primary key in the database. Even when a student is transferred to another school, the ID will not be changed. This ID will be used for other activities such as school transfer, certificate issue, scholarship, stipends etc.

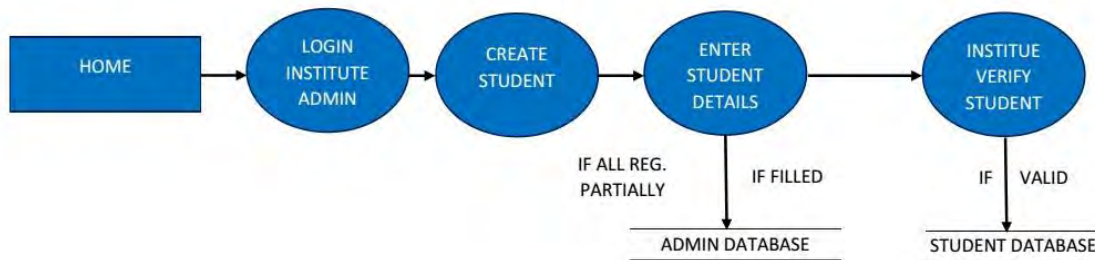


Figure 3.14: Data Flow Diagram for Student Account Creation

3.5.8 Student Module

The module for students is intended to introduce a favorable and organized data exchange environment for students, teachers and administration of a school. This system will enable schools to manage student related information and keep track record of each individuals in order to assess them based on their overall performance. For the students, it will be an information hub to manage their activities. It will provide them all the necessary resources to fulfil their academic activities as well as ease other non-academic activities such as applications, forms, fees payment etc.

Major features of the student module are:

- Online schedule of classes and events
- Notifications on schedule changes
- Lectures and study materials
- Online application for financial aid, board exams or events
- Communication with classmates and teachers
- Upload homework
- Availability of books, papers online for free
- Pictures, yearbooks etc.

3.5.9 Student Transfer

One of the major reason behind developing this system was to carry over a student's information and historic data to the next institution he/she gets transferred to. And the whole process will be much simpler and better managed with the introduction of such system.

In this system, a student will be able to apply for institution transfer from his/her dashboard. When the transfer request gets approved by the admin, his/her institute data will be updated by the central admin and notify all the necessary stakeholders on the changes.

Steps for student transfer:

1. Student login
2. Apply for transferring institution
3. Institute admin check request
4. If valid – institute admin process this file and central admin transfer student's CEIMS ID to another institute
5. If transfer request is not valid then it will be reverted back to the requester for further actions

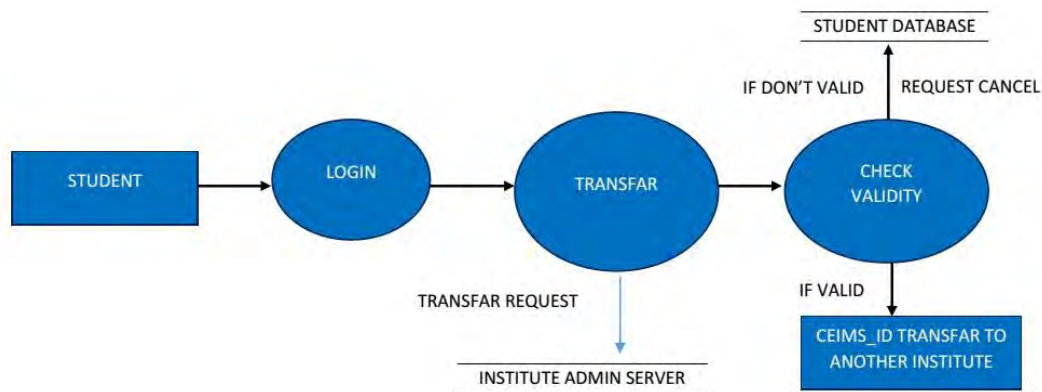


Figure 3.15: Data Flow Diagram for Student Transfer

3.5.10 Scholarships and Stipends Management

Scholarships and stipends can be applied, assessed and managed better and efficiently using this system. Moreover, the transfer of students' institution will not have an effect on his/her stipends and scholarships and the whole transfer can be processes without any additional documents processing.

An additional benefit of using this system is, the authorities will be able to process the scholarship/stipends requests much faster and with better transparency as they will be review students' records, academic and co-curricular performance quickly along with the request. This will make the whole process much faster.

Steps of scholarship and stipends processing -

1. Student login
2. Apply for Scholarship & Stipends
3. Institute admin check validity
4. Scholarship and stipends processing
5. If valid, send data to central admin
6. Central admin process and add required scholarship or stipends to the student

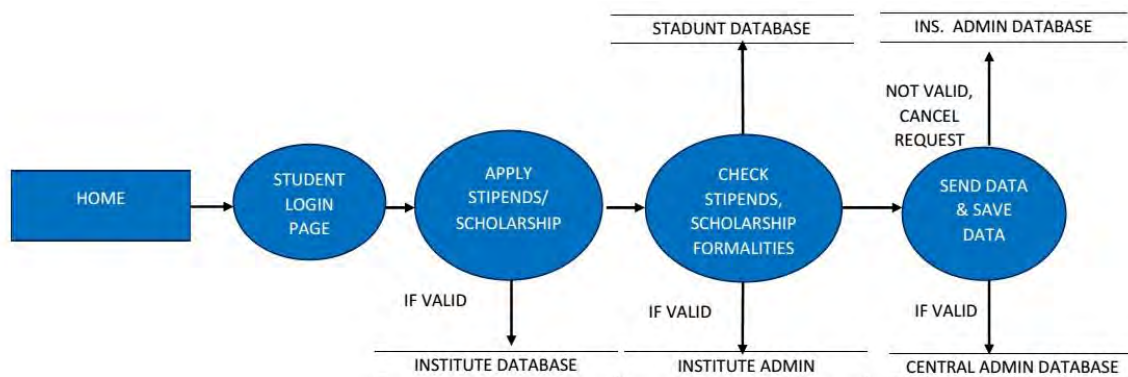


Figure 3.16: Data Flow Diagram for Scholarship and Stipends Transfer

3.5.11 Examination Module

Another major beneficiary of this system will be the management of examinations. It will make the whole process from filling up forms, fee payment, marks record and grade calculation, result publication a whole lot easier.

Some of the major features of this module are –

- Online application facility by students
- Evaluation of student's eligibility to sit for exams
- Auto notification on the schedule and changes
- Easy payment by mobile, online banking
- Better circulation of exam syllabus, course contents
- Auto calculation of grading
- Easier and faster publication of results

3.5.12 Administrative Activities

Administrative activities, such as human resource management, attendance management, salaries and bonuses processing, reporting for higher authorities etc. will become easier, systematic and less time consuming with this system. Which will make institute administration more efficient and cost effective.

3.5.13 Finance and Accounting

Financial activities such as payroll management, fees collection, budgeting and allocation will be more effectively managed with this system. It will make such processes from institution level to Govt. level, much simpler, easier and faster.

Some of the major features for finance and accounting management will be –

- Easier payroll management
- Transparency in all levels
- Easier and effective budgeting and resource allocation
- Better documentation and auditing

3.5.14 Virtual Campus

The virtual campus system is a powerful and effective platform that can provide educational materials to the masses. All the course substance, materials and resources of the education system can be distributed easily using this online framework. It permits educators to effectively distribute their lectures, guidance to their students and oversee their student's advancement. This feature can be highly effective for the indigenous people who don't have schools in their vicinity.

Institutes can also broadcast educational videos, documentaries using the online framework of this system making students more attached with their institution even from home.

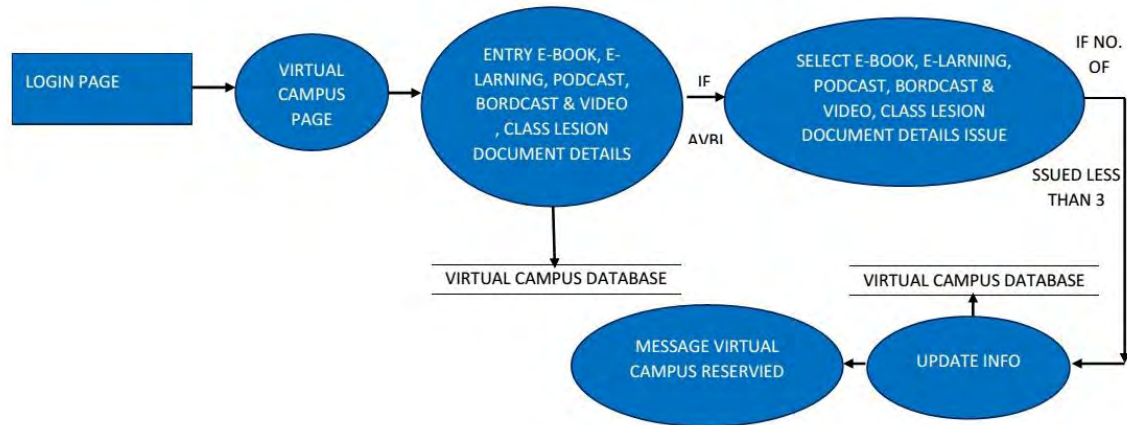


Figure 3.17: Data Flow Diagram for Virtual Campus

3.6 Possible Limitations

While we are extremely optimistic of implementing such an advanced system in such a larger scale, the limitations and possible shortcomings will also have to be considered. Though we have already advanced to a digital age and the penetration rate of ICT is much higher even in our rural areas, it must not be ruled out that any difficulties that may pose this system as a major disturbance will significantly harm the image and effectiveness of the whole system.

Some of the major difficulties that may be faced by this system are –

- Poor infrastructure specially in the rural and poor areas may make it impossible to implement and use
- Lack of enough skilled workforce to maintain such large-scale network
- Cost of maintenance may be very high initially
- Lack of understanding of the processes may make the users unwilling to accept using this system
- No matter how easier this may be made to use, it will still add some complexity on the existing processes

However, the long-term plan and vision for implementation of such system will surely pay off in a longer run.

Chapter 4
CONCLUSION

4.1 Final Words

Despite having many limitations, this proposed system may highlight many opportunities that may be open if such system can be implemented. In the present context of Bangladesh, it may seem this kind of system is quite expensive to implement and difficult to maintain. However, with the growth of our economy and the need for a better education system there could not be a better time for this.

Bangladesh Govt. has plans to include all the students', teachers' information in a national database in conjunction with the "Digital Bangladesh" vision of the Govt. Which shows the willingness of our Govt. to implement a modern, competent management system in the education sector ^[9].

This system, if done right, can take the education sector management of our country to a globally competitive level and provide sustainable development in this sector.

4.2 Future Work

This system was proposed with all the possibilities for further extensions in mind. It can be extended to a fully featured, cross functional ERP system with HRM, Accounts, Inventory Management, Library Management, Virtual Campus, Distant Learning and many other advanced modules.

This can help to automate many of the processes thus will help to reduce cost and workload. It can also be connected with various national databases to comply and serve other national purposes.

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